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(54) **Conveyor.**

(57) A conveyor apparatus comprising a closed endless channel (10) made of non-magnetic material having infeed and outfeed means, inside which are a plurality of sliding spaced apart carrier units (22) arranged successively within and tightly fitted against the wall of the closed endless channel (10), prolongations (25) between successive carrier units to form a continuous conveyor unit, each carrier unit having a core of magnetic material (24) and at least two electromagnetic drive units (20,21) with moving means positioned outside the endless channel (10).

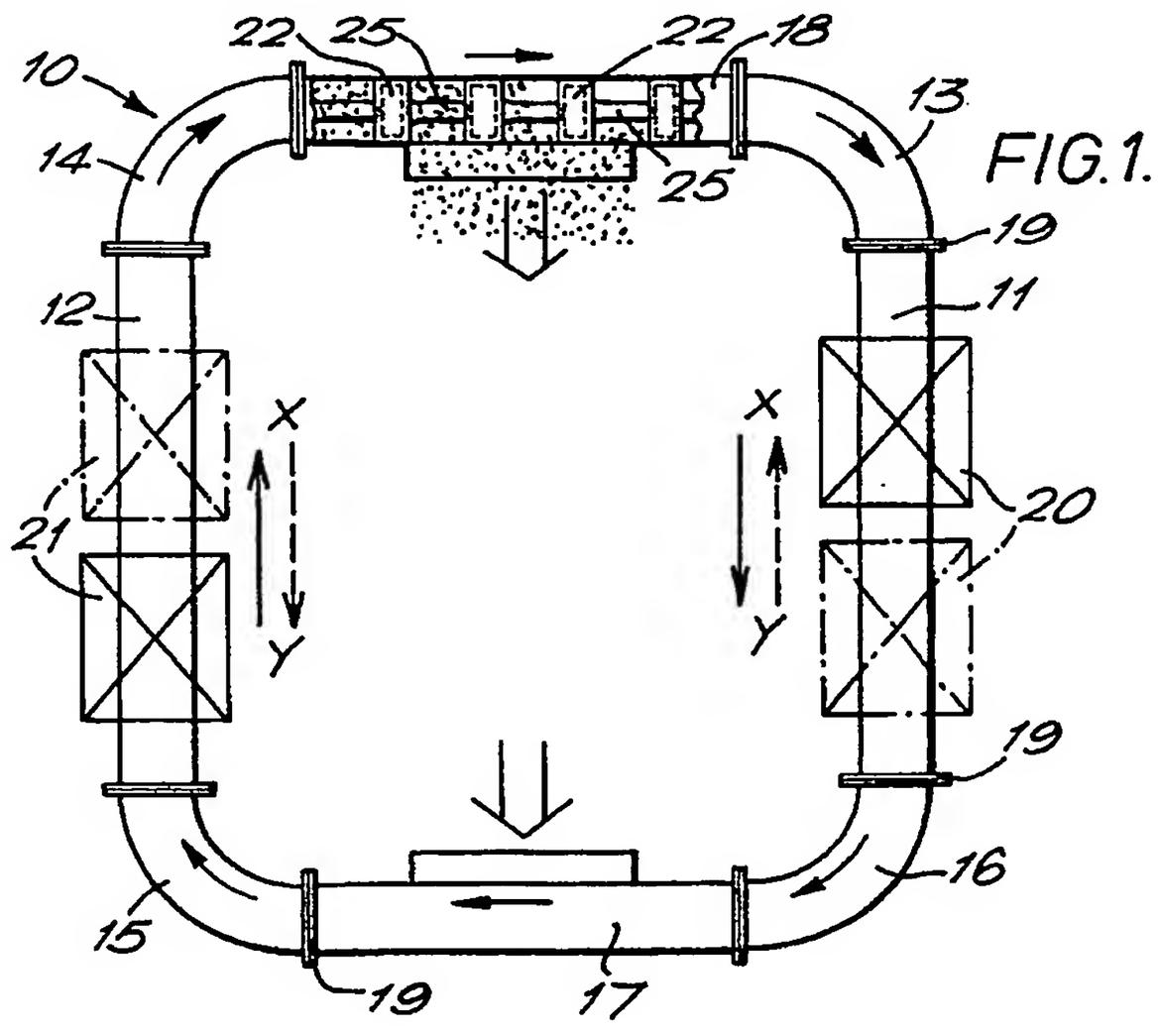

FIG.1.

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THE PRESENT INVENTION RELATES TO A CONVEYOR APPARATUS

Many conveyors available today are unsuitable for transporting delicate products. For example, screw conveyors are not sufficiently gentle. Belt conveyors generally occupy relatively large areas. In addition, the majority of conveyors are not very flexible nor are they particularly hygienic. We have devised a conveyor which can be more hygienic and flexible than other conveyors, more gentle than screw conveyors and more space saving than belt conveyors.

According to the present invention there is provided a conveyor apparatus comprising a closed endless channel made of non-magnetic material having infeed and outfeed means, inside which are a plurality of sliding spaced apart carrier units arranged successively within and tightly fitted against the wall of the closed endless channel, prolongations between successive carrier units to form a continuous conveyor unit, each carrier unit having a core of magnetic material and at least two electromagnetic drive units with moving means positioned outside the endless channel.

The endless channel may be made of non-magnetic material and may be a hose or a tube. It may be built up of nodules such as straight parts, elbows, infeed and outfeed units etc. which may be easily connected and disconnected at any joint, for instance, by rapid clamps without tools. There may, if desired, be more than one infeed and outfeed unit.

The carrier units may be, for example, disc or cup-shaped and they may be made of non-magnetic material such as plastics which may conveniently be moulded around the core of magnetic material. For hygienic reasons, the core of magnetic material is preferably completely surrounded by the cover of the carrier unit.

The carrier units may or may not be joined mechanically to one another by means of the prolongations between successive carrier units. The space formed by the prolongations between each successive carrier unit is to be occupied by the product to be transported. The carrier units thus form one endless conveyor unit where each carrier unit pushes the preceding carrier unit forward.

The electromagnetic drive units may advantageously fully or partly surround the endless channel. More than two drive units may be used e.g. four or even more. The electromagnets may be moved back and forth by mechanical, electrical, pneumatic or hydraulic devices. The current switch on and off of the magnets of the drive units is synchronised with the movement of the drive units. The drive units can easily be transferred from one conveyor to another.

The conveyor apparatus of the present invention is especially suitable for the gentle and hygienic transportation of delicate products because the drive of the carrier unit inside the closed endless channel is touchless. By "touchless" we mean that the carriers are not in contact with any drive means such as cog wheels, shafts, sprockets, etc., which could cause contamination from outside. With suitable design of the infeed and outfeed means, the conveyor could be used for aseptic conveying and filling of products. The conveyor can be designed to meet all demands e.g. it can transport up, down or sideways as desired. It is suitable for all materials which have a piece size small enough to enter the spaces between the carrier units. The endless channel may be flexible, oscillating or may perform some other movement e.g. to discharge a product evenly on the full width of a conveyor belt, etc. Since the endless channel is completely closed, there is no spillage.

The present invention will now be further described by way of example with reference to the accompanying drawings in which

Figure 1 is a top sectional view of the conveyor,

Figure 2 is an enlarged side sectional view of a portion of the conveyor of Figure 1 transporting product and

Figures 3 and 4 are top sectional views of portions of the conveyor to illustrate different shapes of prolongations.

Referring to the drawings, the conveyor apparatus comprises a plastics tube generally designated 10 made up of nodules consisting of straight parts 11,12, elbows 13,14,15,16, infeed unit 17 and outfeed unit 18 connected by joints 19. Surrounding the plastics tube 10 are two ring-shaped electromagnetic drive units 20,21. Inside the plastics tube 10 are disc shaped carrier units 22 having a plastics cover 23 moulded around a core of magnetic steel 24 fitted exactly against the inside walls of the plastics tube 10 and capable of sliding along the plastics tube. Each carrier unit is provided with a prolongation 25 which is "nose" shaped in Figures 1 and 3 and "cage" shaped in Figure 4 which support the succeeding carrier unit in the endless channel.

The product to be transported 26 is present in the spaces between the disc shaped carriers.

In operation, the product to be transported 26 is filled into the spaces between the disc shaped carriers 22 at the infeed unit 17 and the drive units 20,21, reciprocate between the positions indicated by X and Y in Figure 1 by means of conventional mechanical means (not shown). When one electromagnet (20 or 21) of the drive units moves in the

direction of transport as indicated by the solid arrow in Figure 1, its current is switched on and the carrier units inside the tube close to the magnet are influenced by the magnetic force and move with the magnet. At the same time the other electromagnet (20 or 21) moves in the direction opposite to the transport direction with its current switched off so that the carrier units inside the tube close to this electromagnet are not influenced by the magnetic force. This causes the carrier units 22 to slide smoothly in the tube 10 in the direction of the arrows shown in Figure 1 until they reach the outfeed unit 18 where the product 26 is released.

Claims

1. A conveyor apparatus comprising a closed endless channel made of non-magnetic material having infeed and outfeed means, inside which are a plurality of sliding spaced apart carrier units arranged successively within and tightly fitted against the wall of the closed endless channel, prolongations between successive carrier units to form a continuous conveyor unit, each carrier unit having a core of magnetic material and at least two electromagnetic drive units with moving means positioned outside the endless channel.
2. A conveyor apparatus according to claim 1 wherein the carrier units are made of plastics material surrounding a core of magnetic material.
3. A conveyor apparatus according to claim 1 wherein the space formed by the prolongations between each successive carrier unit is occupied by the product to be transported.
4. A conveyor apparatus according to claim 1 wherein the drive units fully surround the endless channel.
5. A conveyor apparatus according to claim 1 wherein the drive units are adapted to be moved back and forth by mechanical, electrical, pneumatic or hydraulic devices.
6. A conveyor apparatus according to claim 1 wherein the current switch on and off of the magnets of the drive units is synchronised with the movement of the drive units.
7. A conveyor apparatus according to claim 1 wherein the closed endless channel is built up of nodules adapted to be easily connected or disconnected at any joint.
8. A conveyor apparatus according to claim 1 wherein the closed endless channel is provided with more than one infeed and outfeed unit.
9. A conveyor apparatus according to claim 1 wherein the closed endless channel is designed to be flexible, oscillating or to perform some other movement.

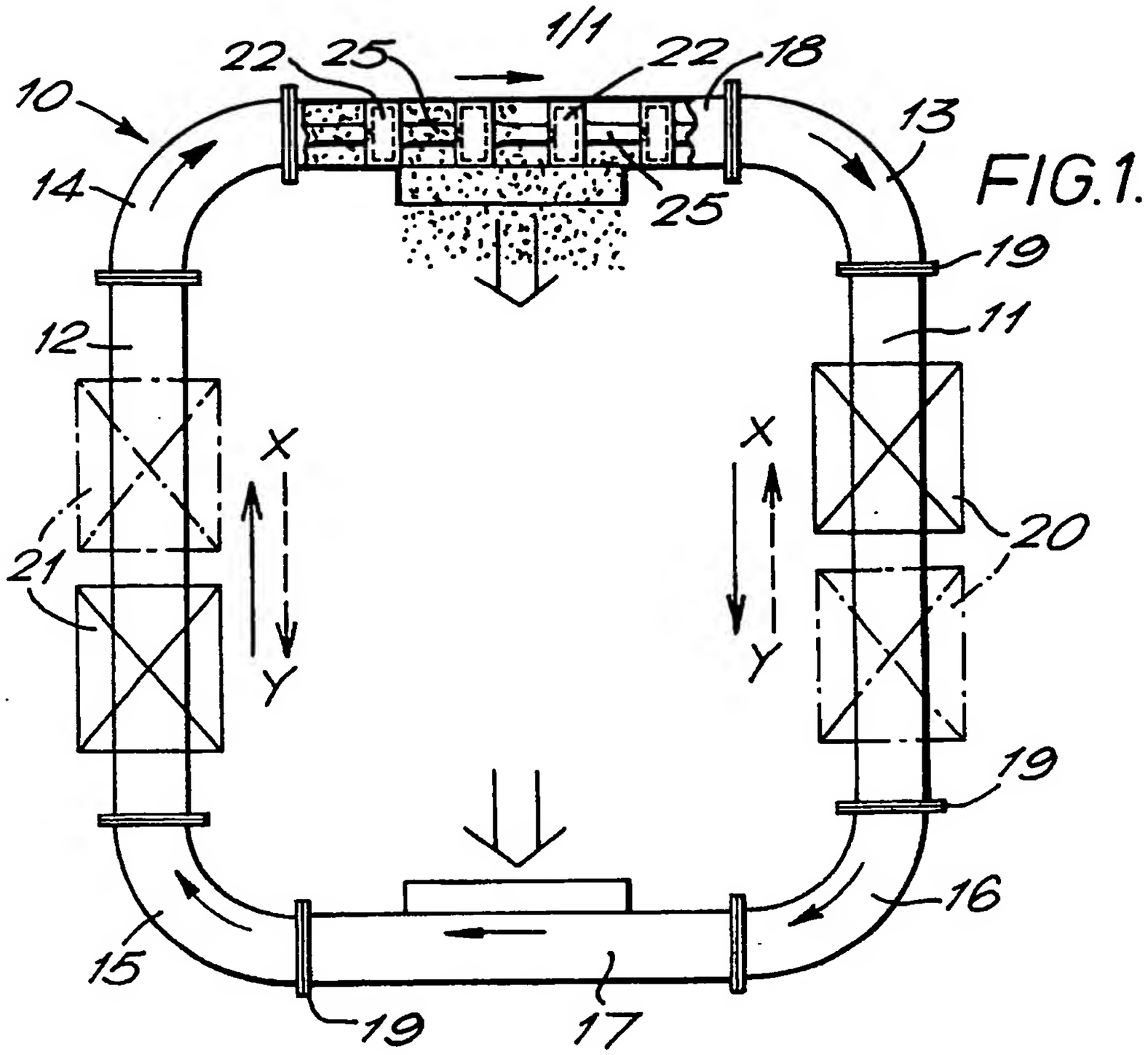
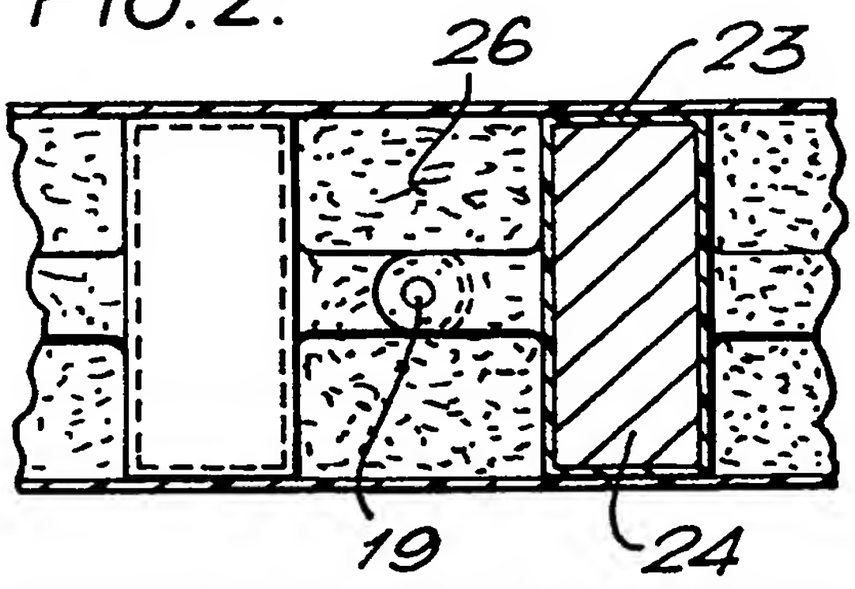


FIG.1.

FIG.2.



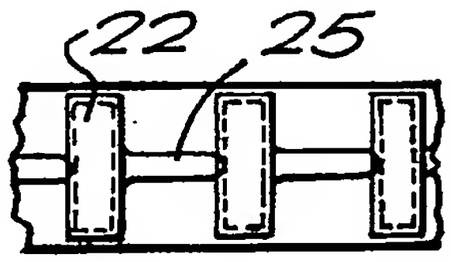


FIG.3.

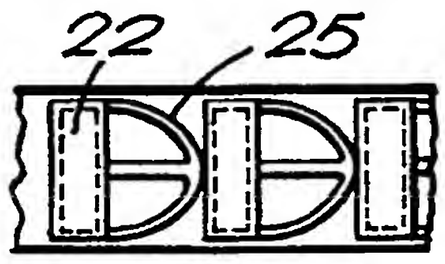


FIG.4.

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EUROPEAN SEARCH REPORT

Application Number

EP 89 11 8745

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-2 756 866 (WILDE) * The whole document * ---	1,3,7	B 65 G 19/14 B 65 G 23/22 B 65 G 54/02
A	PATENT ABSTRACTS OF JAPAN, vol. 10, no. 320 (M-530)[2376], 30th October 1986; & JP-A-61 127 519 (MATSUJI NAKAGOME) 14-06-1986 ---	1,5	
A	EP-A-0 005 331 (DAVY-LOEWY) * The whole document * ---	1,2	
A	US-A-4 062 443 (WALLACE) * The whole document * -----	1,2,4	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 65 G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12-06-1990	OSTYN T.J.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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